

WHAT IS CLAIMED IS:

1                   1.       In a telecommunication system, a method for co-channel  
2 interference identification and mitigation comprising;  
3                   estimating the number and time spans of co-channel interference  
4 channels based on maximum likelihood estimation and minimum description length  
5 from training information derived from a single time division multiple access packet;  
6 and  
7                   applying said estimating to mitigation of co-channel interference at a  
8 receiver.

1                   2.       A method for extracting information from a desired signal using  
2 a received signal in the presence of at least one co-channel interference signal and  
3 intersymbol interference while simultaneously demodulating both the desired signal  
4 and the co-channel interference signals, said method comprising:  
5                   capturing said received signal as channel observations;  
6                   determining a channel model and an initial estimate of corresponding  
7 model parameters for said channel model using said channel observation during a  
8 training portion, said channel model including an estimate of the number of co-channel  
9 interference signals present; and  
10                  performing a joint sequence detection calculation on said channel  
11 observation during a data portion using said channel model and at least one current  
12 estimate of said model parameters thereby to produce an estimate of data representing  
13 said desired signal during said data portion.

1                   3.       The method according to claim 2 wherein said channel model  
2 and initial estimate determining step comprises:  
3                   testing a pre-selected set of said channel models to determine a best  
4 model and corresponding model parameter estimates for said best model.

1                   4.       The method according to claim 3 wherein said channel model  
2 includes an estimate of the number of co-channel interference signals present, an  
3 estimate of a time span of intersymbol interference channel response for the desired  
4 signal and each co-channel interference signal, and a specific combination of training

5 sequences in the training portion for the desired signal and the co-channel interference  
6 signals.

1                   5.       The method according to claim 3 wherein said best model is  
2 determined based on a minimum description length criterion associated with a joint  
3 least squares estimate of intersymbol interference channels of said pre-selected set of  
4 said channel models based on said channel observation during said training portion.

1                   6.       The method according to claim 5 wherein said joint least squares  
2 estimate is obtained by updating a least squares solution of a first impulse response to  
3 apply to a longer impulse response.

1                   7.       The method according to claim 2 wherein said joint sequence  
2 detection is rendered adaptive by repeatedly updating said at least one estimate of said  
3 model parameters.

1                   8.       The method according to claim 7 wherein said model parameters  
2 comprise coefficients of the intersymbol interference channel response for the desired  
3 signal and each co-channel interference signal.

1                   9.       The method according to claim 7 wherein said adaptive joint  
2 sequence detection is performed using per-survivor processing adaptive sequence  
3 detection.

1                   10.      The method according to claim 7 wherein said adaptive joint  
2 sequence detection is performed using single delayed decision feedback estimation  
3 adaptive sequence detection.

1                   11.      The method according to claim 10 wherein said adaptive  
2 sequence detection further includes reduced state techniques in order to reduce  
3 complexity.

1                   12.      The method according to claim 9 wherein said adaptive sequence  
2 detection further includes reduced state techniques in order to reduce complexity.

1                   13.      The method according to claim 8 wherein said adaptive sequence  
2 detection further includes reduced state techniques in order to reduce complexity.

1                   14.     The method according to claim 7 wherein said adaptive sequence  
2     detection further includes reduced state techniques in order to reduce complexity.

1                   15.     The method according to claim 2 wherein said sequence  
2     detection further includes reduced state techniques in order to reduce complexity.

1                   16.     The method according to claim 2 wherein said current estimate  
2     of model parameters is said initial estimate of model parameter for use in a system  
3     having negligible dynamic channel variation.

1                   17.     The method according to claim 2 wherein said training portion  
2     and said data portion are contained within a common packet.

1                   18.     The method according to claim 2 wherein said common data  
2     packet comprises a single burst within a time division multiple access (TDMA) frame.

1                   19.     The method according to claim 2 wherein said joint sequence  
2     detection is performed according to a trellis structure based on the number of co-  
3     channel interference signals present as estimated by said channel model.

1                   20.     The method according to claim 2 wherein said channel model is  
2     constrained to a predetermined number of co-channel interference signals and further  
3     constrained, for the desired signal and each one of said co-channel interference signals,  
4     to a predetermined time span of intersymbol interference channel response and a  
5     predetermined training sequence.

1                   21.     The method according to claim 20 wherein said joint sequence  
2     detection is rendered adaptive by repeatedly updating said at least one estimate of said  
3     model parameters.

1                   22.     The method according to claim 21 wherein said model  
2     parameters comprise coefficients of intersymbol interference channel response for the  
3     desired signal and each co-channel interference signal.

1                   23.     The method according to claim 21 wherein said adaptive joint  
2     sequence detection is performed using per-survivor processing adaptive sequence  
3     detection.

1                   24.    The method according to claim 21 wherein said adaptive joint  
2   sequence detection is performed using single delayed decision feedback estimation  
3   adaptive sequence detection.

1                   25.    The method according to claim 24 wherein said adaptive  
2   sequence detection further includes reduced state techniques in order to reduce  
3   complexity.

1                   26.    The method according to claim 23 wherein said adaptive  
2   sequence detection further includes reduced state techniques in order to reduce  
3   complexity.

1                   27.    The method according to claim 22 wherein said adaptive  
2   sequence detection further includes reduced state techniques in order to reduce  
3   complexity.

1                   28.    The method according to claim 21 wherein said sequence  
2   detection further includes reduced state techniques in order to reduce complexity.

1                   29.    The method according to claim 20 wherein said sequence  
2   detection further includes reduced state techniques in order to reduce complexity.

1                   30.    The method according to claim 20 wherein said current estimate  
2   of model parameters is said initial estimate of model parameter for use in a system  
3   having negligible dynamic channel variation.

1                   31.    The method according to claim 20 wherein said training portion  
2   and said data portion are contained within a common packet.

1                   32.    The method according to claim 20 wherein said common data  
2   packet comprises a single burst within a time division multiple access (TDMA) frame.

1                   33.    The method according to claim 20 wherein said joint sequence  
2   detection is performed according to a trellis structure based on said predetermined  
3   number of co-channel interference signals.

1                   34.     A system for extracting information from a desired signal using a  
2     received signal in the presence of at least one co-channel interference signal and  
3     intersymbol interference while simultaneously demodulating both the desired signal  
4     and the co-channel interference signals, said system comprising:  
5                   a receiver for capturing said received signal as channel observations;  
6                   a channel model and an initial value estimator for estimating a channel  
7     model and an initial estimate of corresponding model parameters for said channel  
8     model using said channel observation during a training portion, said channel model  
9     including an estimate of the number of co-channel interference signals present; and  
10                  a joint sequence detector for calculating a joint sequence on said channel  
11     observation during a data portion using said channel model and at least one current  
12     estimate of said model parameters thereby to produce an estimate of data representing  
13     said desired signal during said data portion.

1                   35.     The system of claim 32 wherein said joint sequence detector is a  
2     trellis-based maximum-likelihood sequence detector.